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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/518,494	12/20/2004	Takashi Aoyama	50340-178	5564
20277 7590 10/02/2007 MCDERMOTT WILL & EMERY LLP 600 13TH STREET, N.W. WASHINGTON, DC 20005-3096				
			EXAMINER NGUYEN, HUY TRAM	
			ART UNIT 1743	PAPER NUMBER
			MAIL DATE 10/02/2007	DELIVERY MODE PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

## Office Action Summary

**Application No.**

10/518,494

**Applicant(s)**

AOYAMA, TAKASHI

**Examiner**

Huy-Tram Nguyen

**Art Unit**

1743

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 20 December 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-8 and 9-15 is/are rejected.
- 7) ☒ Claim(s) 8 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 December 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>December 20, 2004</u> . | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Priority*

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Goebel et al. (US Patent No. 6,921,516)**.

Regarding Claim 1, Goebel et al. reference discloses a fuel reforming device which generates reformat gas comprising hydrogen by reforming a mixture of a hydrocarbon fuel and air, comprising:

a fuel mixing chamber (**Figure 2, numeral 40-auto-ignition and carbon-suppression foam**);

a fuel injector which injects the hydrocarbon fuel into the fuel mixing chamber  
**(Figure 2, numeral 24);**

a first air line which supplies air to the fuel mixing chamber and generates an air-fuel mixture **(Figure 2, numeral 16);**

a reformer **(Figure 2, numeral 34)** comprising a reforming catalyst which generates reformat gas by causing the air-fuel mixture supplied from the fuel mixing chamber to undergo reforming reaction **(Figure 2, numeral 38)**, and an oxidation catalyst which causes the air-fuel mixture to undergo a catalytic Combustion **(Figure 2, numeral 36 – exothermic partial oxidation reaction).**

However, Goebel et al. doesn't disclose the second air. It would have been an obvious matter of design choice to add a second air supply to the mixing chamber, since applicant has not disclosed that additional air supply to the mixing chamber solves any stated problem or is for any particular purpose and it appears that the invention would perform equally well with the fuel reforming device of Goebel et al..

Furthermore, Goebel et al. doesn't disclose the first and second distribution valves. It would have been obvious to one having ordinary skill in the art at the time the invention was made to add the distribution valves to the first and second air supplies since it was known in the art that a distribution valve is used to control the flow rate of air, fuel and other components.

Claims 2-5 and 10-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Goebel et al. (US Patent No. 6,921,516 B2) in view of Goebel et al. (US 2003/0093950 A1) and Edlund et al. (US Patent No. 6,383,670 B1)**

Regarding Claim 2, Goebel et al. (US Pat. 6,921,516) reference discloses the fuel reforming device as defined in Claim 1. However, it does not teach a heater which heats the fuel-air mixture and a controller functioning to control the heater and the air supply amount of the first air distribution.

Goebel et al. (US 2003/0093950) reference teaches the use of external electrical heater to bring the components (i.e. air, fuel) to proper operating temperatures. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the electric heater as taught by Goebel et al. (US 2003/0093950), since Goebel et al. (US 2003/0093950) states at **Page 1, Paragraph [0011]** that such a modification would bring the components to proper operating temperatures since the reformation process operate at high temperatures.

Edlund et al. reference teaches a control system which automates the operating parameters and automatically controlling the operation of the system responsive to the monitored parameters, predefined subroutines and/or user inputs for controlling the operation of a fuel processing system. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the control system as taught by Edlund et al. since it was known in the art that such control system is used for controlling the operation of any fuel processing system such as controlling the feed assembly, the fuel processing, hydrogen producing region, fuel cell stack (**Edlund et al. – Abstract**).

Regarding Claim 3, Goebel et al. and Edlund et al. references disclose the fuel reforming device as defined in Claim 2, wherein the fuel reforming device further

Art Unit: 1743

comprises a sensor which detects a temperature of the reformer, and the controller further functions to determine whether or not the temperature of the reformer is ascending in a state where the air-fuel mixture heated by the heater is supplied to the reformer, and when the temperature of the reformer is ascending, control the heater to stop heating the air-fuel mixture (**Edlund et al. - Column 3, Lines 5-33**).

Regarding Claims 4-5 and 10-11, Goebel et al. and Edlund et al. references disclose the reforming device as the claimed inventions of Claims 4-5 and 10-11. The further functions of the controller and sensor are the intended use of the controlling device.

Regarding Claim 12, Goebel et al. and Edlund et al. references disclose the fuel reforming device as defined in Claim 11, wherein the fuel reforming device further comprises a carbon monoxide removal device which removes carbon monoxide from the reformat gas by a catalytic reaction using air (**Goebel '516 – Column 2, Line 18-27**) and air supply stream to the mixing chamber (**Goebel '516 - Figure 1, numeral 50**) and to PrOx/Vaporizer reactor (**Goebel '516 - Figure 1, numeral 92**).

Regarding Claims 13 and 14, Goebel et al. and Edlund et al. references disclose the fuel reforming device of Claims 13 and 14 including the switch which commands the fuel reforming device to start and stop operation, to stop injection of hydrocarbon fuel and to maximize air supply amount (**Edlund et al. – Column 11, Line 20-27**).

Regarding Claim 15, Goebel et al. and Edlund et al. references disclose the fuel reforming device of Claim 15 including the bypass passage (**Goebel et al. '950 – Figure 1, numeral 44 – bypass valve**).

Claims 6-7 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Goebel et al. (US Patent No. 6,921,516 B2) in view of Goebel et al. (US 2003/0093950 A1)**

Regarding Claim 6, Goebel et al. (US 6,921,516 B2) reference discloses the fuel reforming device as defined in Claim 1 except for the air supply mechanism and heat exchanger.

Goebel et al. (US 2003/0093950 A1) reference discloses these heat exchanger and air supply mechanisms (**Goebel et al. '950 – figure 1, numerals 36, 16 and 50**). It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the air supply mechanism and heat exchanger as taught by Goebel et al. '950 to distribute the air and to heat and/or cool the water/air/gas/effluent streams throughout the reforming system.

Regarding Claim 7, Goebel et al. (US 6,921,516 B2) reference discloses the fuel reforming device as defined in Claim 1 including a carbon monoxide removal device which removes carbon monoxide from the reformat gas by a catalyst reaction using air (**Goebel '516 – Column 2, Line 18-27**) except for the air supply mechanism which supplies air to the first air distribution and the carbon monoxide device.

Goebel et al. (US 2003/0093950 A1) reference discloses a carbon monoxide removal device (**Figure 1, numeral 20-PrOx/Vaporizer reactor**) and air supply stream to the mixing chamber (**Figure 1, numeral 50**) and to PrOx/Vaporizer reactor (**Figure 1, numeral 92**). It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the air supply mechanism and PrOx/Vaporizer

reactor as taught by Goebel et al. '950 to distribute the air throughout the reforming system and remove the carbon monoxide from hydrogen-rich stream.

Regarding Claim 9, Goebel et al. (US 6,921,516 B2) reference discloses the fuel reforming device as defined in Claim 1, wherein the fuel reforming device is used together with a fuel cell stack (**Figure 1, numeral 46**), comprising an anode and a cathode(**Column 1, Line 35-39**), and generating power by the electrochemical reaction between hydrogen in the reformat gas supplied to the anode and oxygen supplied to the cathode (**Column 1, Line 48-50**) except for the combustor which burns an anode effluent discharged from the anode and an air supply mechanism which supplies air to the combustor.

Goebel et al. (US 2003/0093950 A1) reference discloses a combustor (**Figure 1, numeral 26**) to burn anode exhaust or stack effluent (**Page 3, Paragraph [0029]**) and **an air supply mechanism to supply air to the combustor (Figure 1, numeral 90)**. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the combustor and the air supply mechanism as taught by Goebel et al. '950 to provide more oxygen to burn off the exhaust gas from fuel cell/stack.

***Allowable Subject Matter***

Claim 8 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:



Regarding Claim 8, Goebel et al. reference discloses the fuel reforming device as defined in Claim 1, wherein the fuel reforming device is used together with a fuel cell stack (**Figure 2, numeral 46**) comprising an anode and a cathode (**Column 1, Line 35-39**), and generating power by an electrochemical reaction between hydrogen in the reformat gas supplied to the anode and oxygen supplied to the cathode (**Column 1, Line 48-50**). However, Goebel et al. reference does not disclose an air supply mechanism, which supplies air to the anode. No prior art can be found.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Huy-Tram Nguyen whose telephone number is 571-270-3167. The examiner can normally be reached on M - F : 7:30 AM - 5:00 PM (Alternated Friday off).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Walter Griffin can be reached on 571-272-1447. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1743

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

HTN  
9/18/07

  
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SUPERVISORY PATENT EXAMINER